

**2004**

### Internal Assessment Resource

Subject Reference: **Calculus 3.3**

## Internal assessment resource reference number:

**Calc/3/3\_B version 2**

#### “Sunshine”

# Supports internal assessment for:

# Achievement Standard: 90637

Title: Solve problems and equations involving trigonometric functions

Credits: 4

#### Date version published: December 2003

**Ministry of Education** For use in internal assessment

**quality assurance status** from 2004

**Teacher Guidelines:**

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment using this internal assessment resource.

**Context/setting:**

The assessment contains skills questions and problems relating to sunshine hours and temperatures.

Conditions:

This assessment is a class closed book test, needing about 45 minutes.

Students will require access to the Level 3 Calculus formula sheet.

**Resource requirements:**

Access to a computer or graphics calculators is acceptable.

**2004**

**Internal Assessment Resource**

Subject Reference: **Calculus 3.3**

## Internal assessment resource reference number:

**Calc/3/3\_B version 2**

#### “Sunshine”

# Supports internal assessment for:

# Achievement Standard: 90037 version 1

Title: Solve problems and equations involving trigonometric functions

Credits: 4

**Student Instructions Sheet**

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1. Find a solution (in radians) to the equations

a) 

b) 

c) 

2) The times of sunrise in Auckland can be modelled by the curve   




where ***t*** is the time in minutes after midnight

and ***d*** is the number of days after 1 January 2003



and the angle is measured in degrees.  
  
**Use the model to answer these questions:**

* 1. What is number of minutes between the earliest sunrise and the latest sunrise.
  2. How many days are there between the date of the earliest sunrise and the date of the latest sunrise?
  3. What is the time of sunrise 25 days after the 1st January?
  4. What is the first day in the year that has a sunrise at 7:05 am?

1. On a nice February day you would like to form an equation that models the

temperature from midnight one day through to midnight the next day (ie 24 hours).

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The angle is given in degrees.

a) If the lowest temperature is 7o C at 3am and the highest temperature is 29o C at 3 pm, find the the exact equation for this model.

1. Use your model to find the temperature at midnight
2. Use your model to find the temperature at mid day.
3. Give one time when the temperature is 200
   * 1. Prove that



5) Give the general solution to 

1. Find the general solution for  
     
   

# Assessment schedule: Calc/3/3 \_B v2: “Sunshine”

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Achievement criteria | Task | Evidence | Judgement | Sufficiency |
| **Achievement** | Solve straightforward problems with models involving trigonometric functions.  Solve straightforward trigonometric equations. | 2a  2b  2c  1a  1b  1c | 150 mins  180 days  6:17am  Any value of  + (-1)n x 0.243  ± 0.698  + 1.37 | Units not required in this task  Any rounding allowable anywhere in this task  No alternative  Allow 181, 182,183  Allow values close to this. | Any 2 correct from 2a 2b, and 2c.  Replacement Evidence 3c, 3d.  AND  Any 2 correct from 1a, 1b and 1c  Replacement Evidence 2d, 3e or 5 |
| Achievement with Merit | Solve problems with models that involve trigonometric functions  Use trigonometric manipulation.. | 3a  b  c  d  2d  4  5 | 10.20  25.8o  9.7 or 20.3 hours after midnight or 9:42 am or 8:18pm  66 days after 1 January | Allow equivalent functions including sine.  No alternative  No alternatives  Any one  Must have the 66 days  Alternative proofs are acceptable  Or equivalent solution  Accept answer + | Achievement plus 3a correct  AND  2 of 3c, 3d, 3e  AND  2 of  2d, 4 and 5  Replacement evidence for manipulation 6 |
| Achievement with Excellence | Apply knowledge of trigonometric relationships to solve complex problem(s). | 6 |  |  | Both 3b and at least one solution in 6 |